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| 10/697,358 | 10/30/2003 | Xianglin Wang | SAM2.0032 | 7881 |

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| EXAMINER | |
|---|---|
| TORRES, JOSE | |

| ART UNIT | PAPER NUMBER |
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| 2112 | |

DATE MAILED: 11/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/697,358 | WANG ET AL. | |
| | Examiner | Art Unit | |
| | Jose M. Torres | 2112 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-14,17,19,21,22,24-34,37 and 39* is/are rejected.

7)☒ Claim(s) *3,15,16,18,20,23,35,36,38 and 40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/01/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities:

- Page 26 line 21: "ASIC" should be -- Application-Specific Integrated Circuit (ASIC) --

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Ozawa et al. (U.S. 5,257,326).

Re claim 1: Ozawa et al. disclose a method of interpolating image positions in an original image to produce an interpolated output image, wherein the original image is represented by digital input pixel data (Col. 1 lines 9-11), comprising the steps of: (a) providing a first filter having a sharp interpolation characteristic (FIG. 1, "low-pass filter **4**", Col. 4 lines 49-52); (b) providing a second filter having a smooth interpolation characteristic (FIG. 1,"low-pass filter **5**", Col. 4 lines 49-51); (c) interpolating a selected image position in the image using the first filter to

generate a sharp interpolation output value (FIG. 1,"low-frequency component signal **6**", Col. 4 lines 51-53); (d) interpolating a selected image position in the image using the second filter to generate a smooth interpolation output value (FIG. 1, "low-frequency component signal **7**", lines 51-53); (e) calculating a weighting coefficient for the output of each filter (FIG. 1, "coefficient calculation circuit **8**", Col. 4 lines 53-55); and (f) selectively combining the output values from the filters as a function of the weighting coefficients, to generate an interpolation output value for the selected image position of an interpolated output image (FIG. 1, "interpolation signal **11**", Col. 4 lines 60-63).

Re claim 21: Ozawa et al. disclose an interpolation system that interpolates image positions in an original image to produce an interpolated output image, wherein the original image is represented by digital input pixel data (Col. 1 lines 9-11), comprising: (a) a first filter having a sharp interpolation characteristic (FIG. 1, "low-pass filter **4**", Col. 4 lines 49-52), the first filter interpolating a selected image position in the image to generate a sharp interpolation output value (FIG. 1,"low-frequency component signal **6**", Col. 4 lines 51-53); (b) a second filter having a smooth interpolation characteristic (FIG. 1,"low-pass filter **5**", Col. 4 lines 49-51), the second filter interpolating the selected image position in the image to generate a smooth interpolation output value (FIG. 1, "low-frequency component signal **7**", lines 51-53); (c) a controller that calculates a weighting coefficient for the output of each filter (FIG. 1, "coefficient calculation circuit **8**",

Col. 4 lines 53-55); and (d) a combiner (FIG. 1, "coefficient calculation circuit **8**") that selectively combines the output values from the filters as a function of the weighting coefficients, to generate an interpolation output value for the selected image position of an interpolated output image (FIG. 1, "interpolation signal **11**", Col. 4 lines 60-63).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa et al. in view of Chui (U.S. 6,411,305 B1). The teachings of Ozawa et al. have been discussed above.

However, Ozawa et al. fails to disclose estimating the image high frequency level at the selected image position; and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level. And the controller calculates the weighting coefficient for each of the two filters by estimating the image high frequency level at the selected image position, and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level.

Chui teaches estimating the image high frequency level at the selected image position (FIG. 11, "sharpening data **304**", Col. 11 lines 13-17); and calculating a

weighting coefficient for the output of the filter based on the estimated image high frequency level ("sharpening parameter S', Col. 11 line 16) as recited in claim 2, and the controller calculates the weighting coefficient for each of the two filters by estimating the image high frequency level at the selected image position (FIG. 11, "high pass filters **244, 246** and sharpening data **304**", Col. 11 lines 13-17), and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level ("sharpening parameter S', Col. 11 line 16) as recited in claim 22.

Therefore, in view of Chui, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ozawa et al.'s system and method by incorporating the method steps and high pass filters for estimating the image high frequency level at the selected image position and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level in order to increase the control over the image sharpening and interpolation process.

6. Claims 4 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa et al. in view of Chui as applied to claims 2 and 22 above, and further in view of Curry et al. (U.S. 2004/0001234). The teachings of Ozawa et al. as modified by Chui have been discussed above.

However, the teachings of Ozawa et al. as modified by Chui fail to disclose the interpolation output value $q$ for the selected image position is according to the relation: $q = r*\alpha+s*(1-\alpha)$ wherein $\alpha$ and $(1-\alpha)$ are the weighting coefficients for the first and

second filters, respectively ***(0≤ α≤1)***, and ***r*** and ***s*** are the filter output values from the first and second filters, respectively.

Curry et al. teaches (the combiner (FIG. 8, "linear interpolation unit **810**", Paragraph [0115]) determines) the interpolation output value ***q*** ("output value") for the selected image position is according to the relation: ***q = r*α+s*(1-α)*** (Equation (23), Paragraph [0116]) wherein ***α*** and ***(1-α)*** ("blending fractions", Paragraph [0117]) are the weighting coefficients for the first and second filters, respectively ***(0≤ α≤1)***, and ***r*** and ***s*** ("*BLR_n* and *BLR_(n+1)*", Paragraph [0117]) are the filter output values from the first and second filters, respectively <u>as recited in claim 4</u>, and the combiner determines the interpolation output value ***q*** for the selected image position is according to the relation: ***q = r*α+s*(1-α)*** wherein ***α*** and ***(1-α)*** are the weighting coefficients for the first and second filters, respectively ***(0≤ α≤1)***, and ***r*** and ***s*** are the filter output values from the first and second filters, respectively <u>as recited in claims 4 and 24</u>.

Therefore, in view of Curry et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Ozawa et al.'s system as modified by Chui by including the method step and the linear interpolation unit to determine the interpolation output value ***q*** for the selected image position is according to the relation: ***q = r*α+s*(1-α)*** wherein ***α*** and ***(1-α)*** are the weighting coefficients for the first and second filters, respectively ***(0≤ α≤1)***, and ***r*** and ***s*** are the filter output values from the first and second filters, respectively in order to enhance the visual quality of text and art images.

7. Claims 5-11and 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa et al. in view of Wu et al. (U.S. 5,959,693). The teachings of Ozawa et al. have been discussed above.

Ozawa et al. further teaches the two filters are low-pass filters, such that the first filter has a sharp frequency transition band and the second filter has a smooth frequency transition band (FIG. 1, "low-pass filters **4** and **5**", Col. 4 lines 49-51 and Col. 5 lines 5-6) as recited in claims 11 and 31.

However, Ozawa et al. fails to disclose the first filter comprises a polyphase filter; the second filter, comprises a polyphase filter, the first filter comprises a one dimensional FIR polyphase filter; and the second filter comprises a one dimensional FIR polyphase filter, the two polyphase filters have the same length, each of the polyphase filters comprises a N-tap M-phase polyphase filter, for arbitrary or variable interpolation ratios, M has a value of I0 or larger, and N can be either an odd or an even number value.

Wu et al. teaches the first filter comprises a polyphase filter; the second filter, comprises a polyphase filter (FIG. 2 **275** and **280**, Col. 5 lines 26-28 and Col. 6 lines 46-47) as recited in claims 5 and 25, the first filter comprises a one dimensional FIR polyphase filter; and the second filter comprises a one dimensional FIR polyphase filter (Col. 5 lines 27-28) as recited in claims 6 and 26, the two polyphase filters have the same length ("filter length M", Col. 5 lines 32-42) as recited in claims 7 and 27, each of the polyphase filters comprises a N-tap M-phase polyphase filter (Col. 5 lines 42-54) as recited in claims 8 and 28, for arbitrary or variable interpolation ratios, M has a value of

l0 or larger, and N can be either an odd or an even number value (Col. 5 lines 42-54 and 63-65) as recited in claims 9, 10, 29 and 30.

Therefore, in view of Wu et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ozawa et al.'s system by incorporating the first filter comprising a one dimensional FIR polyphase filter; the second filter, comprising a one dimensional FIR polyphase filter, the two polyphase filters have the same length, each of the polyphase filters comprises a N-tap M-phase polyphase filter, for arbitrary or variable interpolation ratios, M has a value of l0 or larger, and N can be either an odd or an even number value in order to enable an inexpensive implementation for reducing the presence of noise in a digital image.

8. Claims 12, 13, 17, 19, 32, 33, 37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa et al. in view of Wu et al. as applied to claim 8 above, and further in view of Chui. The teachings of Ozawa et al. as modified by Wu et al. have been discussed above.

However, the teachings of Ozawa et al. as modified by Wu et al. fails to disclose estimating the image high frequency level at the selected image position, and calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level; and the image high frequency level at the selected image position is estimated based on the image high frequency components measured at original image pixels neighboring the selected image position, the image high frequency component at the original image pixels is measured using a high-pass filtering process,

the image high frequency level at the selected image position is estimated based on the image high frequency components calculated at two original image pixels closest to the selected image position, and the image high frequency level at the selected image position is estimated based on the image high frequency component measured at the original image pixels that are within the filtering range of the interpolation to the selected image position.

Chui teaches estimating the image high frequency level at the selected image position ("corresponding regions of the initial image data" Co. 11 lines 13-15), and calculating a weighting coefficient ("sharpening parameter S") for the output of the filter based on the estimated image high frequency level; and the image high frequency level at the selected image position is estimated based on the image high frequency components measured at original image pixels neighboring the selected image position (FIG. 11, "sharpening data **304**", Col. 11 lines 13-17) as recited in claims 12 and 32, the image high frequency component at the original image pixels is measured using a high-pass filtering process (FIG. 11, "highpass filters **244** and **246**", Col. 11 lines 13-15) as recited in claims 13 and 33, the image high frequency level at the selected image position is estimated based on the image high frequency components calculated at two original image pixels closest to the selected image position ("two-dimensional image magnified by a factor of four", Col. 9 lines 28-37) as recited in claims 17 and 37, and the image high frequency level at the selected image position is estimated based on the image high frequency component measured at the original image pixels that are within

the filtering range of the interpolation to the selected image position ("corresponding regions of the original image data", Col. 11 lines 17-15) as recited in claims 19 and 39.

Therefore, in view of Chui, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Ozawa et al.'s system by incorporating the method steps of estimating the image high frequency level at the selected image position, calculating a weighting coefficient for the output of the filter based on the estimated image high frequency level; and the image high frequency level at the selected image position is estimated based on the image high frequency components measured at original image pixels neighboring the selected image position, the image high frequency component at the original image pixels is measured using a high-pass filtering process the image high frequency level at the selected image position is estimated based on the image high frequency components calculated at two original image pixels closest to the selected image position, and the image high frequency level at the selected image position is estimated based on the image high frequency component measured at the original image pixels that are within the filtering range of the interpolation to the selected image position in order to produce a sharper magnified image data.

9. Claims 14 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ozawa et al. as modified by Wu et al. and Chui as applied to claims 13 and 33 above, respectively and further in view of Weldy (U.S. 6,574,365 B1). The teachings of Ozawa et al. modified by Wu et al. and Chui have been discussed above.

However the teachings of Ozawa et al. modified by Wu et al. and Chui fails to disclose the image high frequency component at the original image pixels is measured using a high-pass FIR filter.

Weldy teaches the image high frequency component at the original image pixels is measured using a high-pass FIR filter (Col. 3 lines 59-67 and Col. 4 lines 1-4) as recited in claims 14 and 34.

Therefore, in view of Weldy, it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Ozawa et al.'s system as modified by Wu et al. and Chui by incorporating the method step of the image high frequency component at the original image pixels is measured using a high-pass FIR filter in order to provide gain correction factors to improve the color balance of the image.

### *Allowable Subject Matter*

10. Claims 3, 15, 16, 18, 20, 23, 35, 36, 38 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Conclusion*

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Slavin disclose an Image Resizing Using Asymmetric FIR Filters,

Sasai disclose an Image Processing Apparatus and Mahmoodi disclose a System and Method for Adaptive Interpolation of Image Data.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jose M. Torres whose telephone number is 571-270-1356. The examiner can normally be reached on Monday thru Friday: 8:00am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jong-Suk (James) Lee can be reached on 571-272-7044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMT
11/21/2006

JONG SUK LEE
SUPERVISORY PATENT EXAMINER